FIG. 1

CONTROL CENTER (CC)

THE SAME AS LEFT

FIG. 2

14

14b 14e 14g 14j 14s 14u 14w

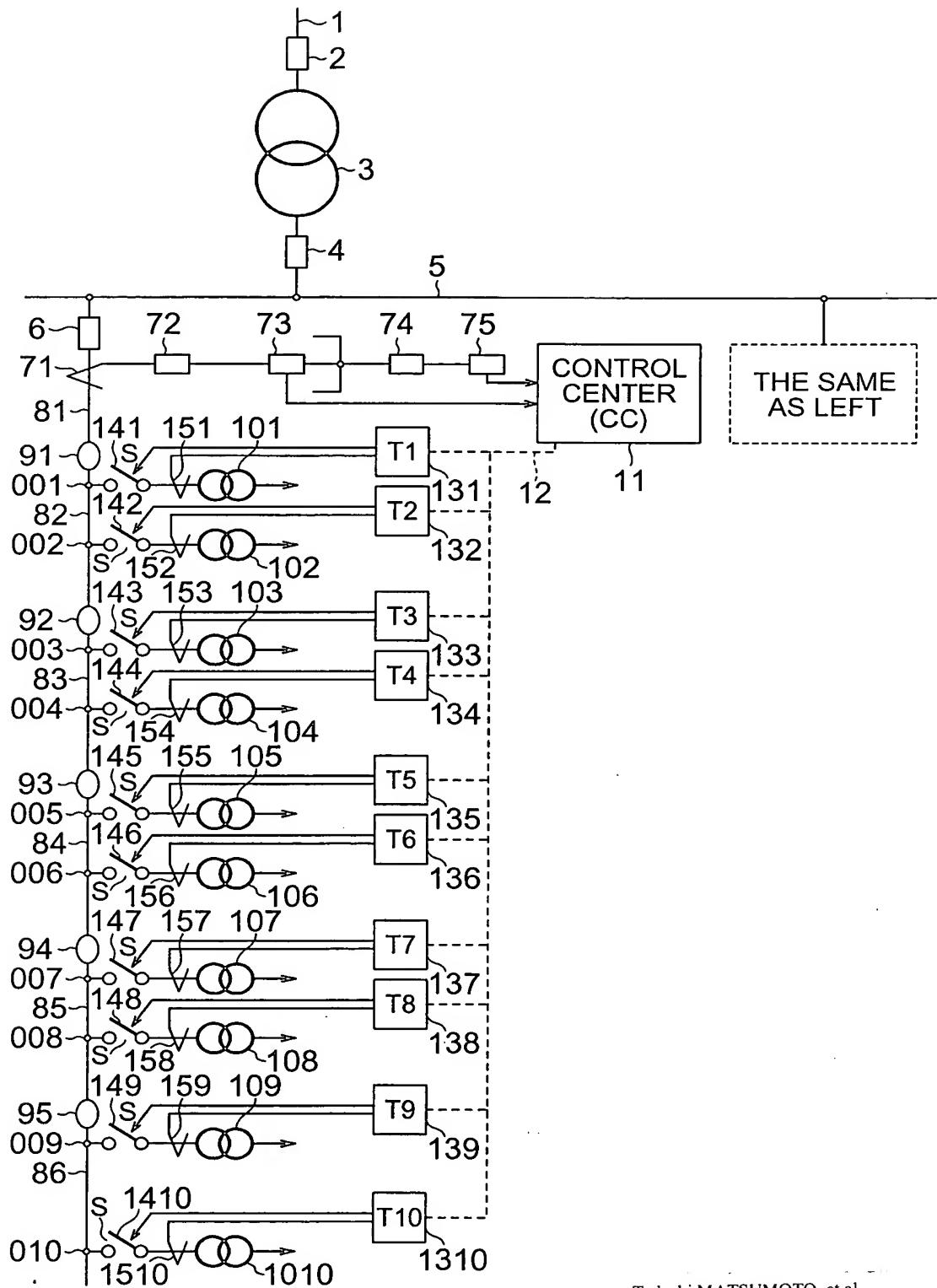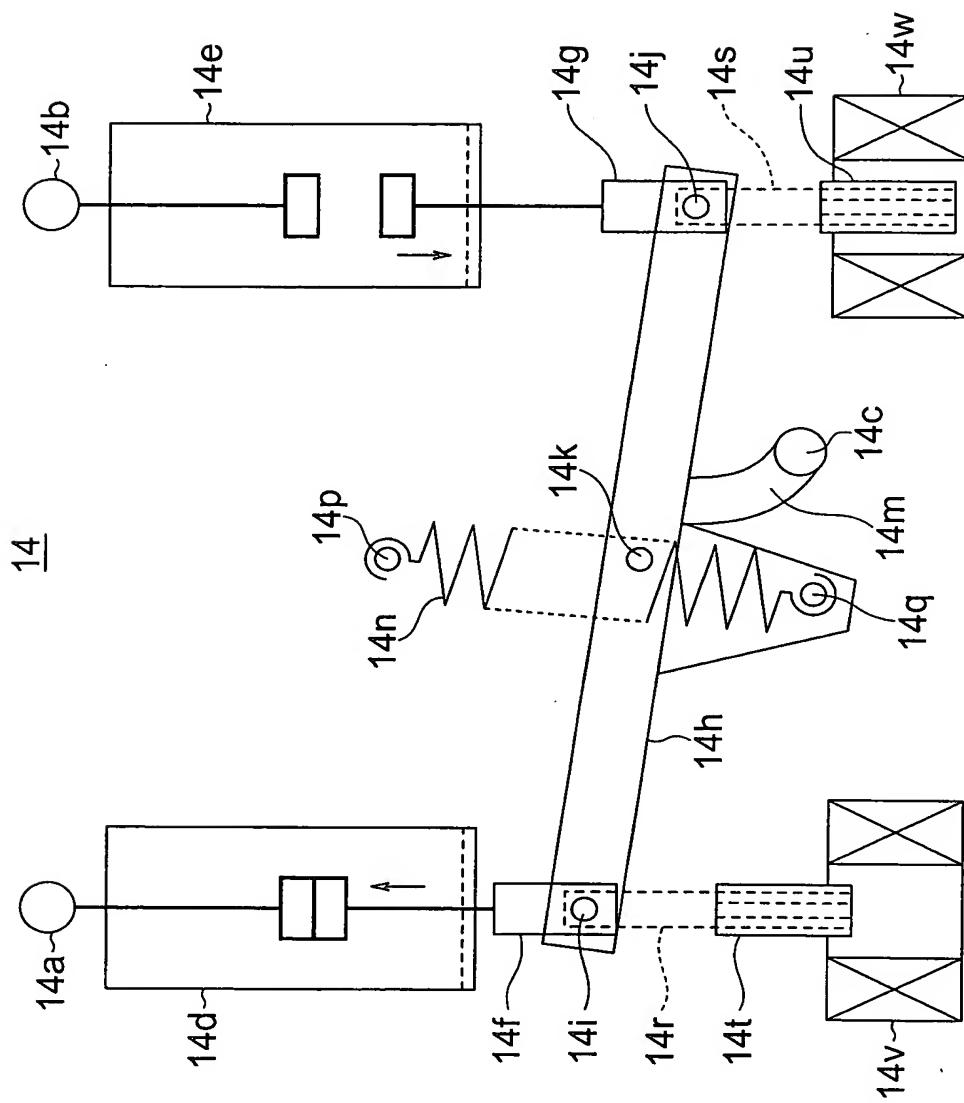14p 14n 14k 14c 14m 14q 14h

14a 14d 14f 14i 14r 14t 14v

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FIG. 3

14'

14b

14e

14m

14c

14v

14t

14g

14h

14r

14f

14i

14k

14s

14j

14u

14d

14w

14a

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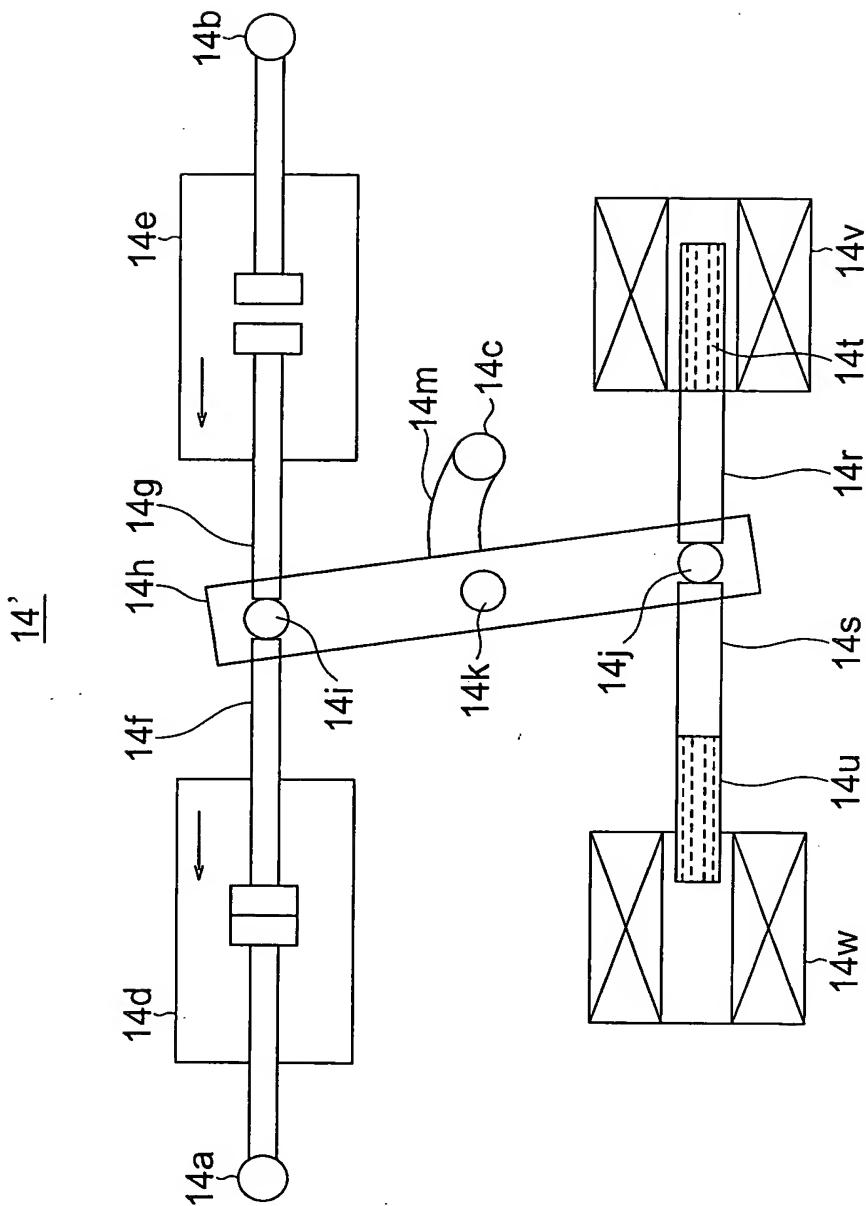Date Filed: November 24, 2003
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FIG. 4

FIG. 5

CONTROL CENTER (CC)

I/O SIGNAL TRANSMISSION PORTION — 115

CONTROL SIGNAL

MONITORING SIGNAL

EQUIPMENT DATABASE — 110

OUTPUT PATTERN ARITHMETIC OPERATION PORTION — 114

111 — COMPARISON PORTION

112 — COMPARISON PORTION

113 — COMPARISON PORTION

116 — ALARM OUTPUT PORTION

ALARM SIGNAL

73A — PHASE CURRENT DETECTOR
731 733 734
732
OUTPUT CIRCUIT

73B — PHASE CURRENT DETECTOR
731 733 734
732
OUTPUT CIRCUIT

73C — PHASE CURRENT DETECTOR
731 733 734
732
OUTPUT CIRCUIT

75 — ZERO-PHASE CURRENT DETECTOR
751 753 754
752
OUTPUT CIRCUIT

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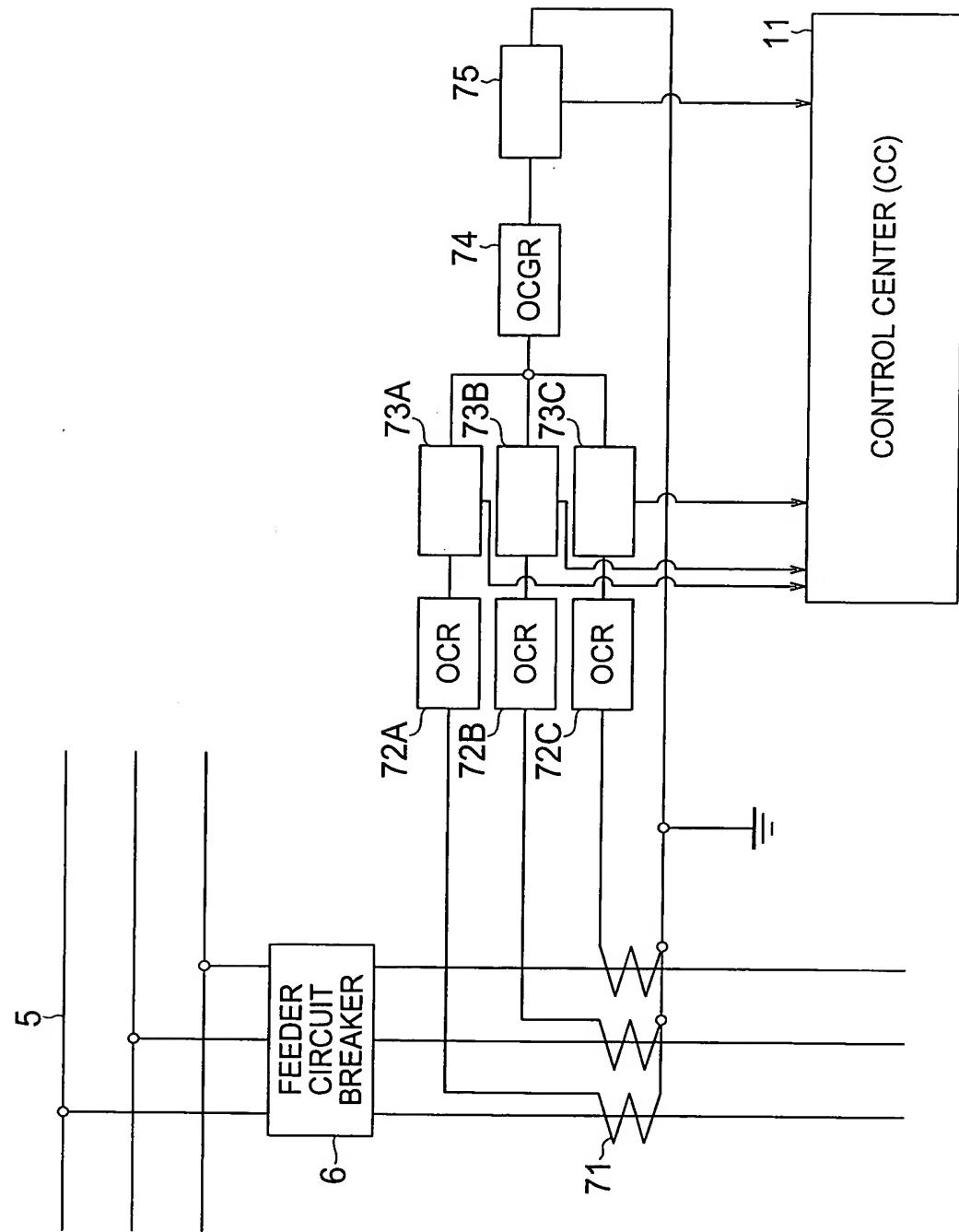Alan J. Kasper   (202) 293-7060
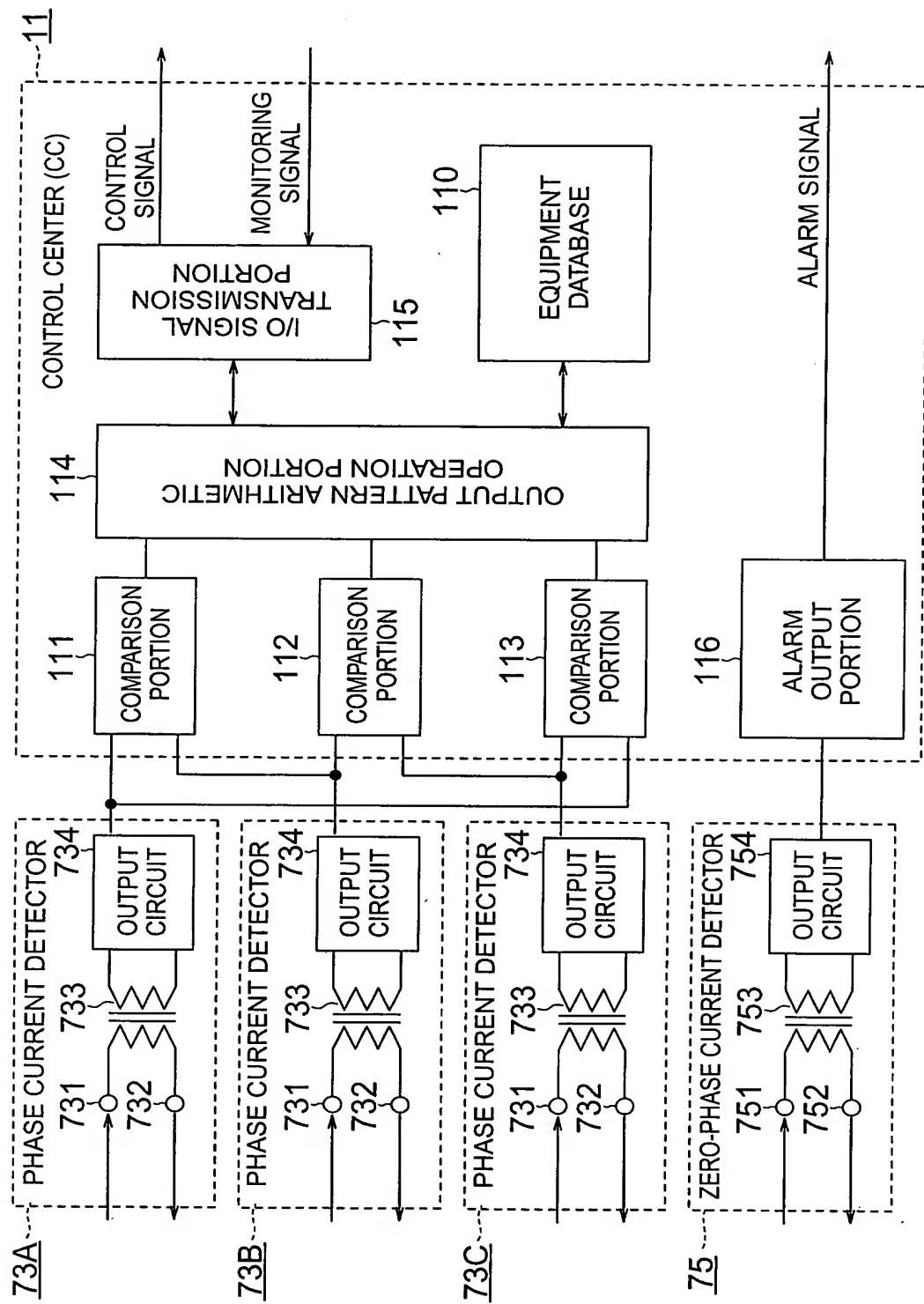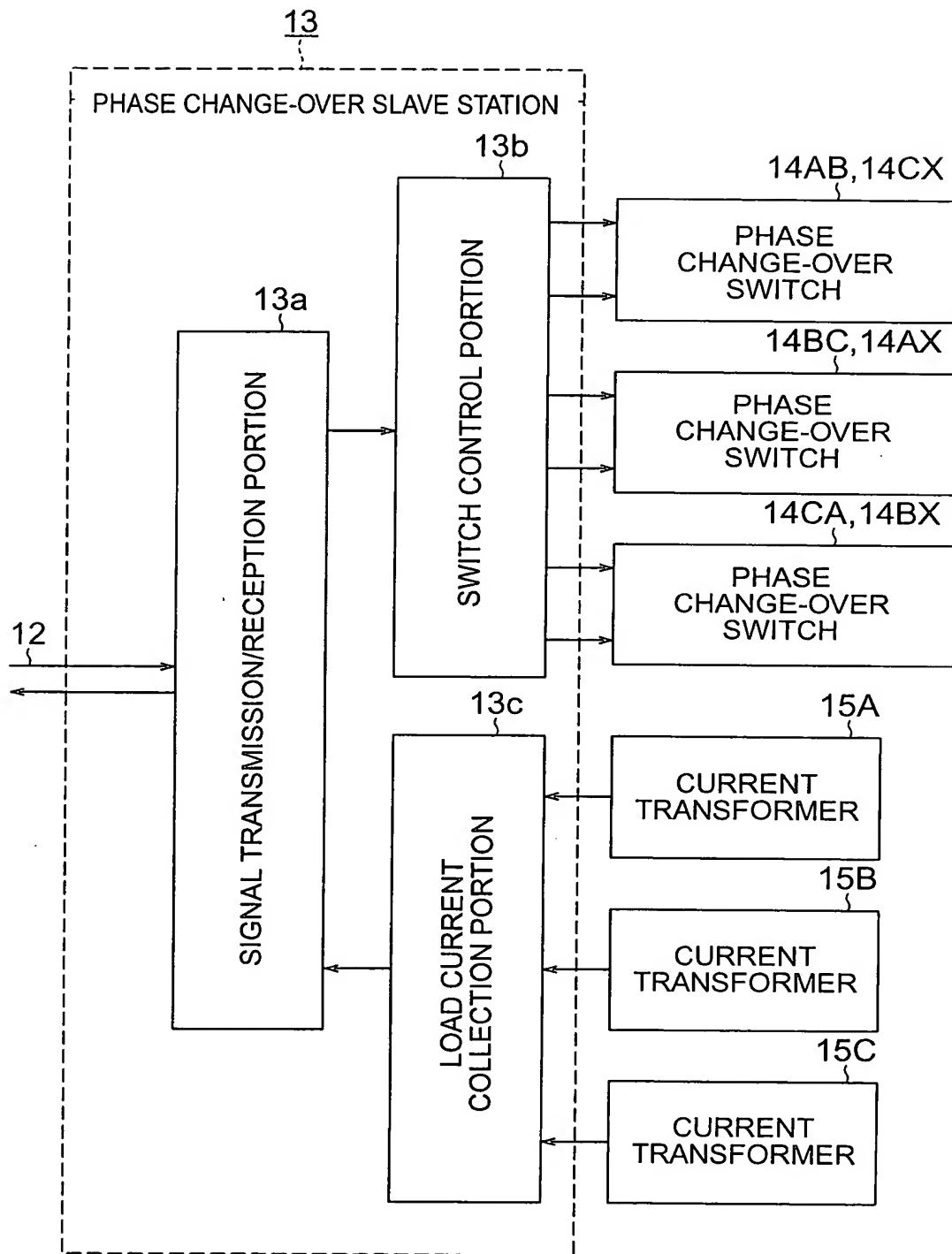5 of 14

FIG. 6

<u>13</u>

PHASE CHANGE-OVER SLAVE STATION

13b

SWITCH CONTROL PORTION

13a

SIGNAL TRANSMISSION/RECEPTION PORTION

12

14AB,14CX

PHASE CHANGE-OVER SWITCH

14BC,14AX

PHASE CHANGE-OVER SWITCH

14CA,14BX

PHASE CHANGE-OVER SWITCH

13c

LOAD CURRENT COLLECTION PORTION

15A

CURRENT TRANSFORMER

15B

CURRENT TRANSFORMER

15C

CURRENT TRANSFORMER

FIG. 7

```
        ┌─────────────┐
        │    START    │
        └──────┬──────┘
               │
               ▼
   ┌───────────────────────┐
   │  INPUT PHASE CURRENTS, │ ～1101
   │  AND ZERO-PHASE CURRENT│
   └───────────┬───────────┘
               │
               ▼
   ┌───────────────────────┐
   │  COMPARE PHASE CURRENTS│ ～1102
   │     WITH ONE ANOTHER   │
   └───────────┬───────────┘
               │
               ▼
   ┌───────────────────────┐
   │ DETERMINE OUTPUT PATTERN│ ～1103
   └───────────┬───────────┘
               │
               ▼
   ┌───────────────────────┐
   │ CONTROL PHASE CHANGE-OVER│ ～1104
   └───────────┬───────────┘
               │
               ▼
   ┌───────────────────────┐
   │  CONTROL TIME LIMIT FOR │ ～1105
   │    PHASE CHANGE-OVER   │
   └───────────┬───────────┘
               │
               ▼
        ┌─────────────┐
        │     END     │
        └─────────────┘
```

FIG. 8

PATTERN NO.	CLASSIFICATION	OUTPUT CONTENTS
1	PHASE A FIXING	PART OF PHASE B IS CHANGED OVER TO PHASE C
2	SAME OF ABOVE	PART OF PHASE C IS CHANGED OVER TO PHASE B
3	PHASE B FIXING	PART OF PHASE C IS CHANGED OVER TO PHASE A
4	SAME OF ABOVE	PART OF PHASE A IS CHANGED OVER TO PHASE C
5	PHASE C FIXING	PART OF PHASE A IS CHANGED OVER TO PHASE B
6	SAME OF ABOVE	PART OF PHASE B IS CHANGED OVER TO PHASE A
7	PHASE A BREAK-UP	PART OF PHASE A IS CHANGED OVER TO PHASE B
8	SAME OF ABOVE	PART OF PHASE A IS CHANGED OVER TO PHASE C
9	SAME OF ABOVE	PART OF PHASE A IS CHANGED OVER TO PHASES B AND C
10	PHASE B BREAK-UP	PART OF PHASE B IS CHANGED OVER TO PHASE C
11	SAME OF ABOVE	PART OF PHASE B IS CHANGED OVER TO PHASE A
12	SAME OF ABOVE	PART OF PHASE B IS CHANGED OVER TO PHASES C AND A
13	PHASE C BREAK-UP	PART OF PHASE C IS CHANGED OVER TO PHASE A
14	SAME OF ABOVE	PART OF PHASE C IS CHANGED OVER TO PHASE B
15	SAME OF ABOVE	PART OF PHASE C IS CHANGED OVER TO PHASES A AND B

FIG. 9

INSTALLATION POINT / PHASE	CURRENT PHASE LOAD (kVA)			UPDATED PHASE LOAD (kVA)		
	A	B	C	A	B	C
001	20	30	20	20	30	20
002	50	30	20	50	30	20
003	150= 100+50	100= 50+50	50= 0+50	50= 0+50	100= 50+50	150= 100+50
004	150= 100+50	150= 100+50	50= 0+50	50= 0+50	150= 100+50	150= 100+50
005	100	100	50	100	100	50
006	100= 50+50	100= 50+50	50= 0+50	50= 0+50	100= 50+50	100= 50+50
007	30	50	20	30	50	20
008	50	20	20	50	20	20
009	100	30	30	100	30	30
010	30	30	20	30	30	20
TOTAL kVA	780	640	330	530	610	580
PHASE CURRENT A	118.2	97.0	50.0	80.3	92.4	87.9
ZERO-PHASE CURRENT (3I0) A	((59.2))			((0.9))		

FIG. 10

OPERATING TIME CHARACTERISTICS
ACCORDING TO PRESENT INVENTION

OPERATING TIME CHARACTERISTICS OF
OVER-CURRENT GROUNDING RELAY (OCGR)

TIME (sec)

0.05 0.1

CURRENT (P.U.)

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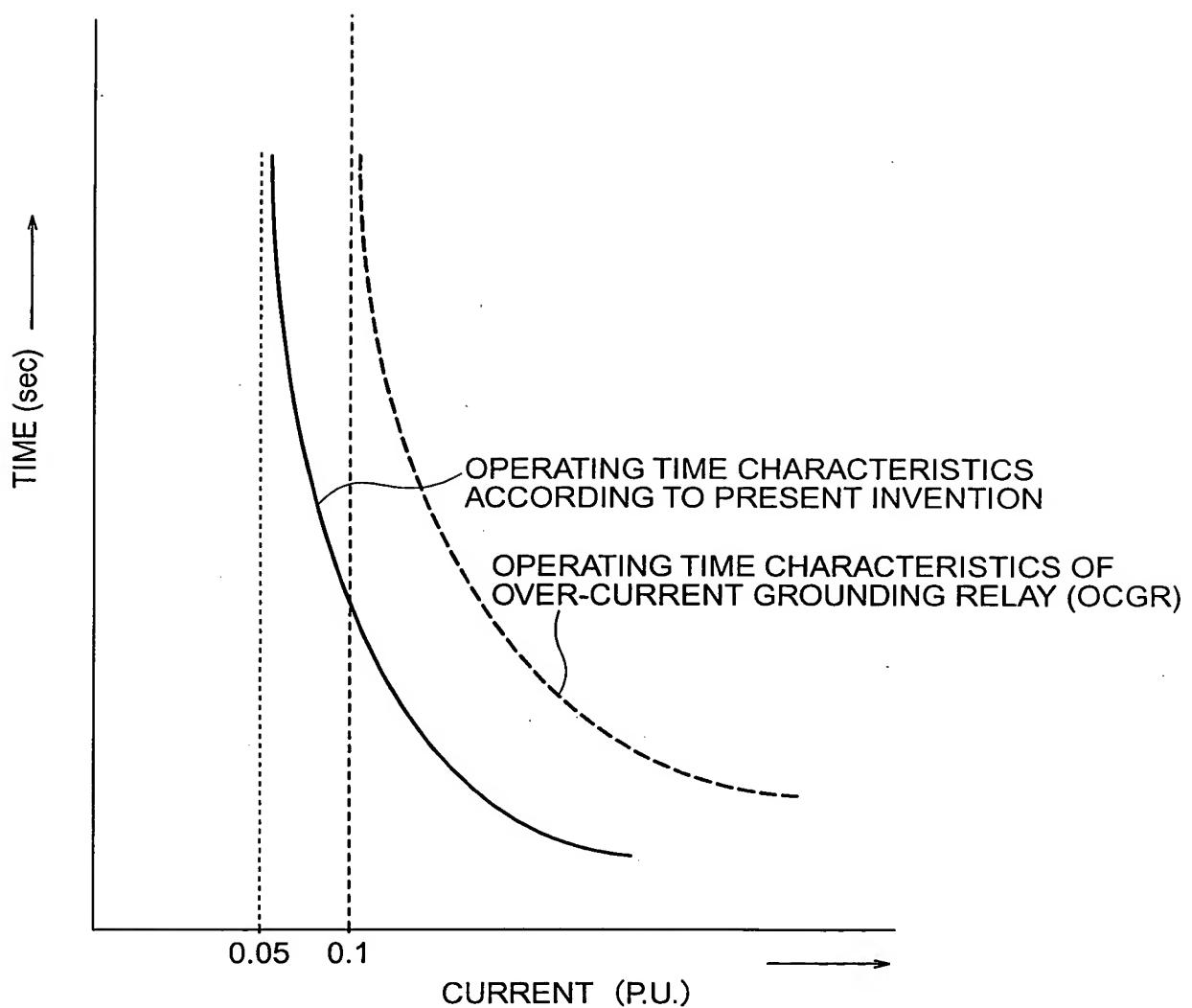CONTROL SYSTEM FOR CANCELING LOAD
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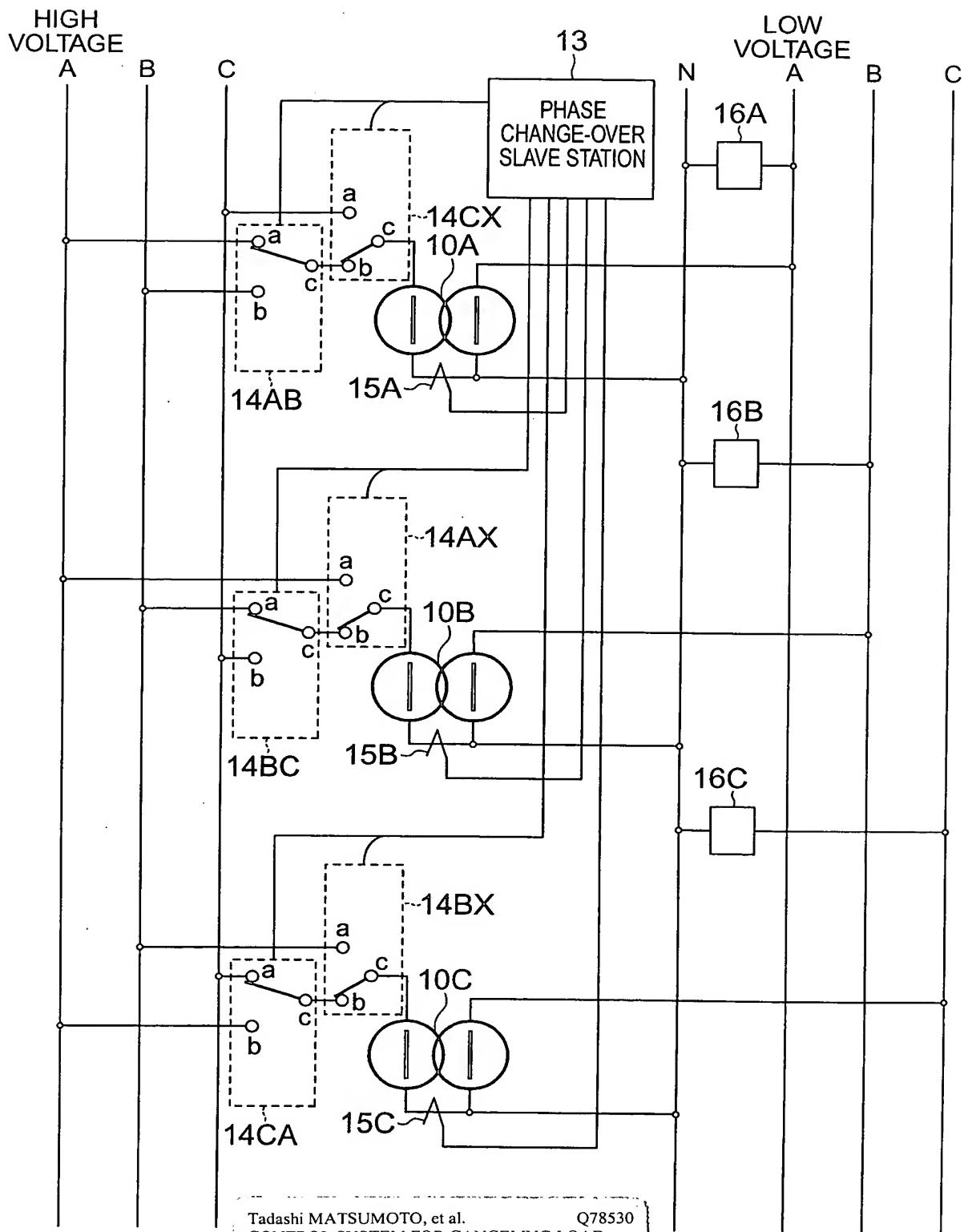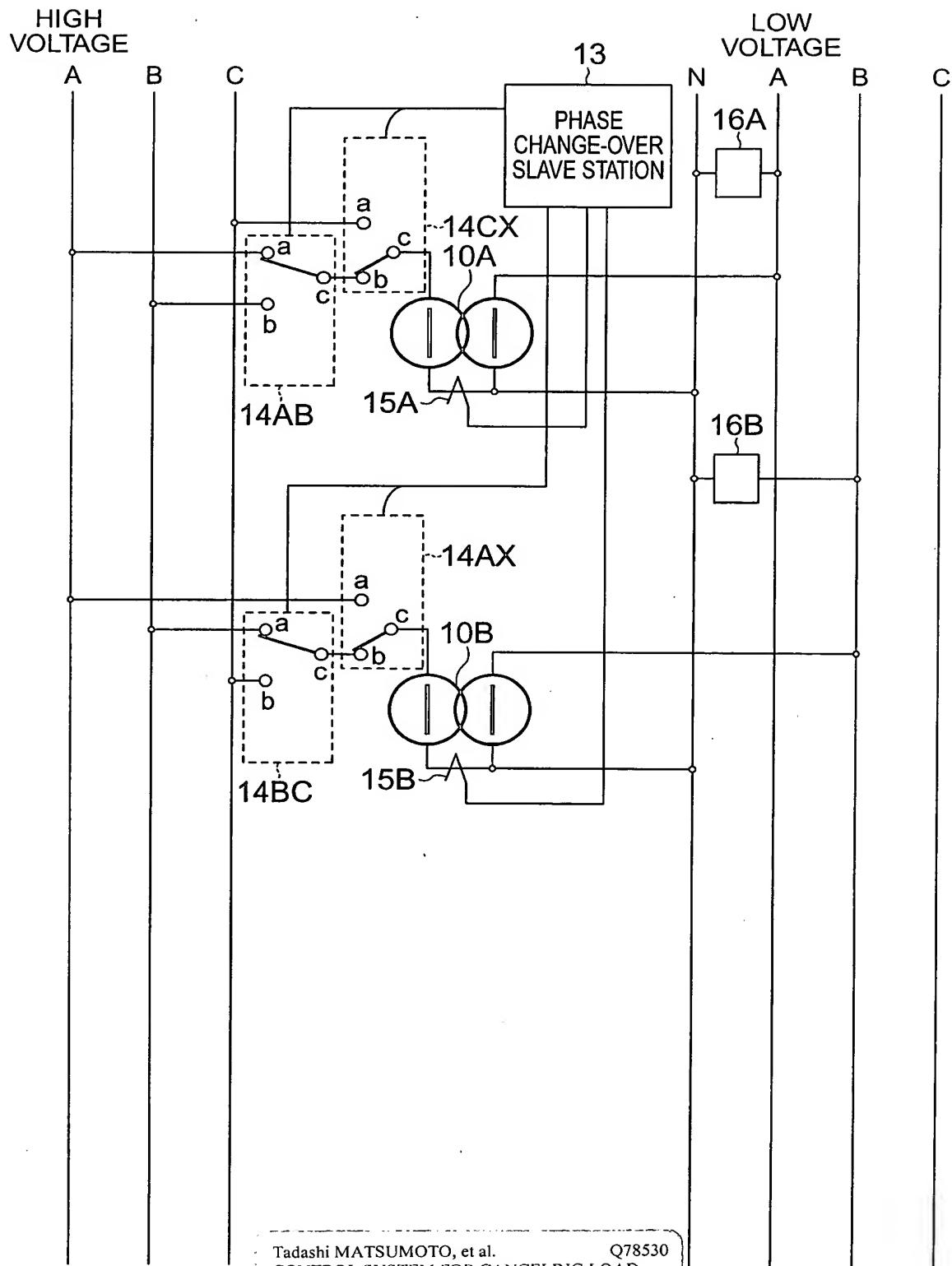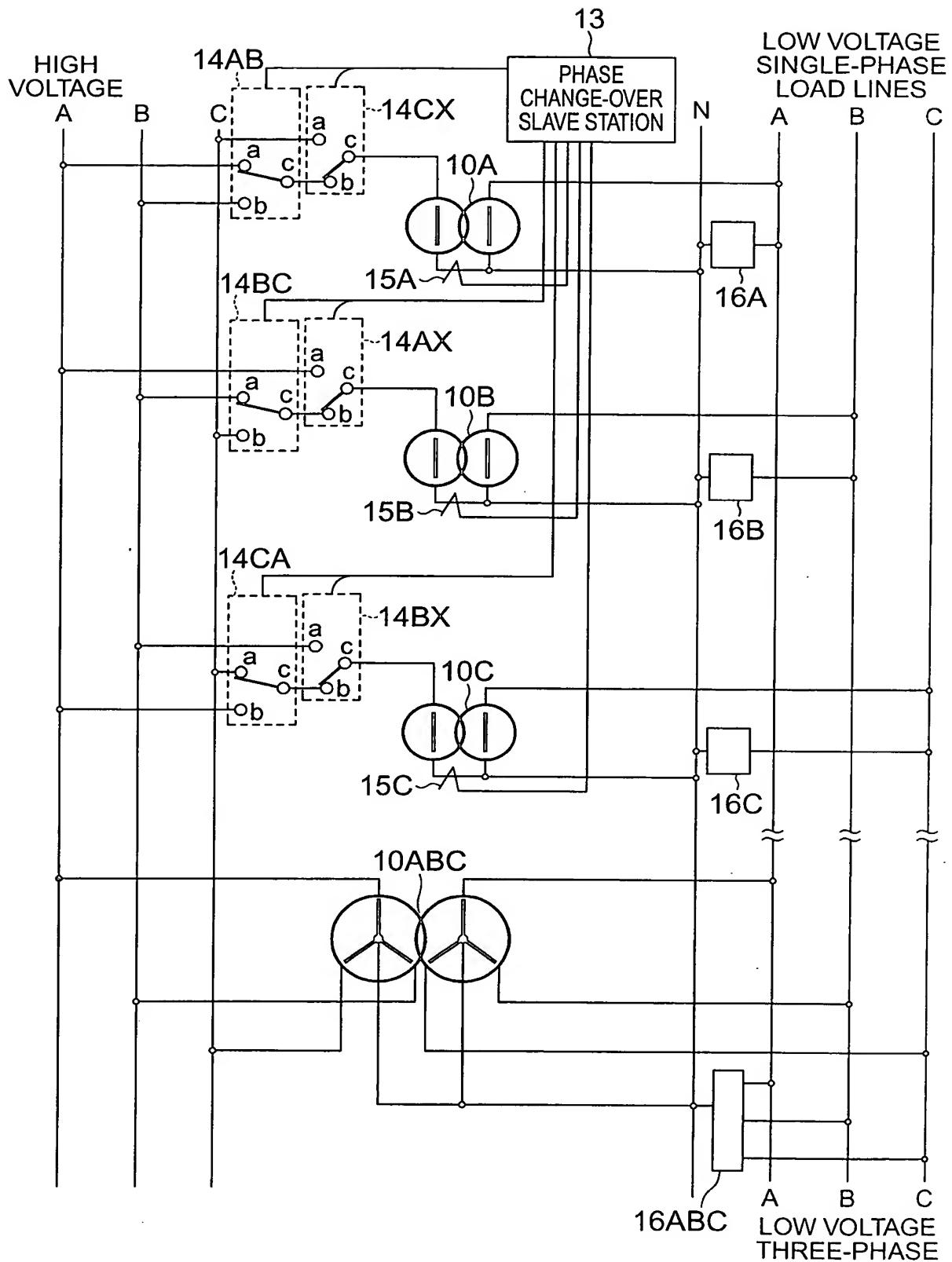Alan J. Kasper   (202) 293-7060
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FIG. 11

HIGH
VOLTAGE
A   B   C

LOW
VOLTAGE
N   A   B   C

13

PHASE
CHANGE-OVER
SLAVE STATION

16A

14CX
10A

a
c
b

a
c

14AB

b

15A

16B

14AX

a
c
b

a
c

14BC

b

10B

15B

16C

14BX

a
c
b

a
c

14CA

b

10C

15C

FIG. 12

HIGH
VOLTAGE

A   B   C

LOW
VOLTAGE

13

N   A   B   C

PHASE
CHANGE-OVER
SLAVE STATION

16A

a

14CX

c

a

10A

b

c

b

14AB

15A

16B

14AX

a

c

a

10B

b

c

b

14BC

15B

FIG. 13

HIGH VOLTAGE

A B C

14AB

14CX

14BC

14AX

14CA

14BX

10A

15A

10B

15B

10C

15C

10ABC

13

PHASE CHANGE-OVER SLAVE STATION

N

LOW VOLTAGE SINGLE-PHASE LOAD LINES

A B C

16A

16B

16C

16ABC

A B C

LOW VOLTAGE THREE-PHASE LOAD LINES
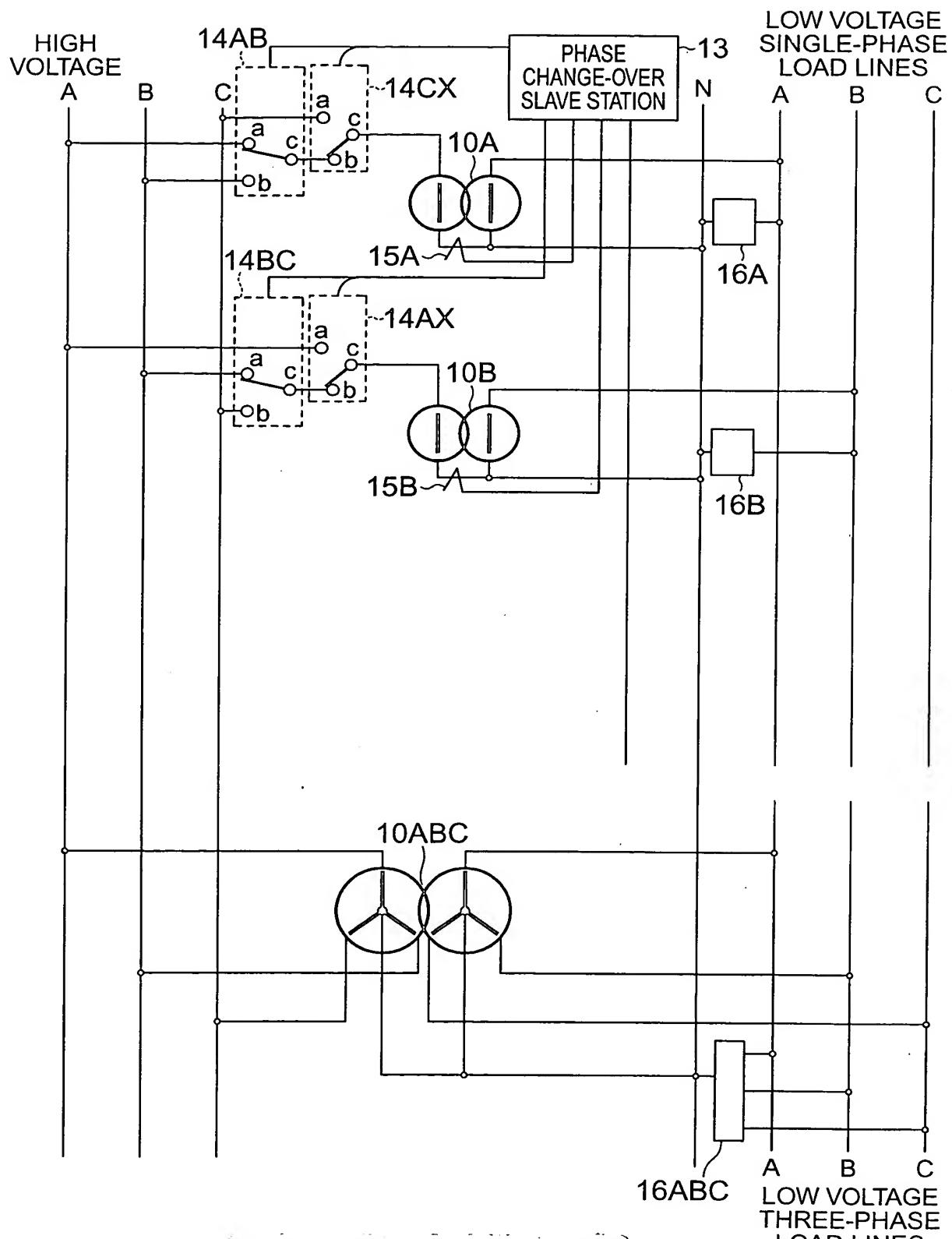
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FIG. 14

HIGH VOLTAGE

14AB

14CX

LOW VOLTAGE SINGLE-PHASE LOAD LINES

A B C

a c
a c b
b

PHASE CHANGE-OVER SLAVE STATION ~13

N A B C

10A

15A

16A

14BC

14AX

a c
a c b
b

10B

15B

16B

10ABC

16ABC

A B C
LOW VOLTAGE THREE-PHASE LOAD LINES